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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4306

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ALUMINUM ALLOY PLATE
6.4Zn - 2.4Mg - 2.2Cu - 0.12Zr (7150-T6151)
Solution Heat Treated, Stress Relieved, and Aged

UNS A97150

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of plate.

1.2 Application: Primarily for parts requiring a high level of mechanical properties and moderate resistance to exfoliation corrosion (See 8.1).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices shall apply. The applicable issue of other documents shall be specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2202 - Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate
MAM 2202 - Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
MAM 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units

2.1.2 Aerospace Recommended Practices:

ARP1704 - Short-Bar Fracture Toughness of Metallic Materials, Determination of

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B594 - Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications
ASTM B645 - Plane Strain Fracture Toughness Testing of Aluminum Alloys
ASTM B660 - Packaging/Packing of Aluminum and Magnesium Products
ASTM E602 - Sharp-Notch Tension Testing with Cylindrical Specimens

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 2355 or MAM 2355:

	min	max
Zinc	5.9	6.9
Magnesium	2.0	2.7
Copper	1.9	2.5
Zirconium	0.08	0.15
Iron	--	0.15
Silicon	--	0.12
Manganese	--	0.10
Titanium	--	0.06
Chromium	--	0.04
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: Solution heat treated, stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and aged. Solution heat treatment shall be performed in accordance with MIL-H-6088 except that solution heat treatment temperature and times shall be as shown for alloy 7050.

3.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties: Plate shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355 except as specified in 3.3.3.1.1 and 3.3.3.1.2.

3.3.1 Tensile Properties: Shall be as specified in Table I and 3.3.1.1.

TABLE I

Nominal Thickness Inches	Specimen Orientation	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
0.750 to 1.000, incl	Longitudinal	84,000	78,000	9
	Long Transverse	84,000	78,000	9
Over 1.000 to 1.500, incl	Longitudinal	84,000	78,000	9
	Long Transverse	84,000	77,000	9

TABLE I (SI)

Nominal Thickness Millimetres	Specimen Orientation	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm or 4D %, min
19.05 to 25.40, incl	Longitudinal	580	540	9
	Long Transverse	580	540	9
Over 25.40 to 38.10, incl	Longitudinal	580	540	9
	Long Transverse	580	530	9

3.3.1.1 Tensile property requirements for plate under 0.750 inch (19.00 mm) or over 1.500 inch (38.10 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 Corrosion Resistance: Electrical conductivity, determined on the surface of the plate, shall be 29.0 - 33.5% IACS (International Annealed Copper Standard) (16.8 - 19.4 MS/m). (See 8.2).

3.3.3 Fracture Toughness: When tested, plate 0.750 - 1.500 inch (19.05 - 38.10 mm) in nominal thickness shall have K_{Ic} not lower than 22 ksi$\sqrt{\text{in.}}$ (24 MPa $\sqrt{\text{m}}$), determined in the L-T direction using full thickness specimens and specimen configurations conforming to ASTM B645.

3.3.3.1 Notch Tensile Strength/Tensile Yield Strength (NTS/TYS) Ratios: The producer may guarantee that plate meets the fracture toughness (K_{Ic}) requirements based on correlation with notch tensile strength/tensile yield strength (NTS/TYS) ratio, determined in accordance with 3.3.3.1.1, or correlation with the short-bar fracture toughness results, determined in accordance with 3.3.3.1.2 in lieu of determining fracture toughness (3.3.3), provided that correlation between the two tests for the plate has been established.

3.3.3.1.1 For plate 0.750 to 1.500 inch (19.05 to 38.10 mm) incl, in nominal thickness, notch tensile strength shall be determined in accordance with ASTM E602 on specimens taken in the longitudinal direction. The longitudinal notch tensile strength shall be divided by the tensile yield strength, determined for the same direction, to obtain the NTS/TYS ratio.

3.3.3.1.2 Short-Bar Fracture Toughness: Shall be not lower than 22 ksi$\sqrt{\text{in.}}$ (24 MPa$\sqrt{\text{m}}$), determined in accordance with ARP 1704.

3.4 Quality: Plate, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the plate.

3.4.1 Each plate shall be ultrasonically inspected in accordance with ASTM B594 and shall meet the following requirements:

3.4.1.1 Plate 0.750 - 1.500 inch (19.05 - 38.10 mm) in nominal thickness and weighing 2000 lb (900 kg) and under shall meet ultrasonic class A.

3.4.1.2 The ultrasonic class for plate under 0.750 in. (19.05 mm) or over 1.500 inch (38.10 mm) in nominal thickness or weighing over 2000 lb (900 kg) shall be as agreed upon by purchaser and vendor.

3.5 Tolerances: Shall conform to all applicable requirements of AMS 2202 or MAM 2202.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibilty for Inspection: The vendor of plate shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the plate conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), long-transverse tensile properties (3.3.1), ultrasonic soundness (3.4.1), tolerances (3.5), and, when specified, longitudinal tensile properties (3.3.1) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for corrosion resistance (3.3.2) and fracture toughness (3.3.3) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355 and the following:

4.3.1 Tensile specimens shall be taken with the axis of specimens in the long-transverse direction and, when specified, in the longitudinal direction.

4.3.2 Specimens for corrosion resistance testing (3.3.2) shall be taken from the samples used for long-transverse tensile testing.

4.4 Reports:

4.4.1 The vendor of plate shall furnish with each shipment a report stating that the plate conforms to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 4306, size, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 4306, contractor or other direct supplier of plate, part number, and quantity. When plate for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of plate to determine conformance to the requirements of this specification and shall include in the report either a statement that the plate conforms or copies of laboratory tests showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2355 or MAM 2355.